REMARKS

Claims 1, 3-13, 15-26, 28-34 and 36-38 are currently pending. Claims 1, 3-9, 11, 13, 15-21, 23, 25-26, 28, 31-32, 34, and 36 are amended. Claims 12, 24, 29-30, and 37-38 are canceled without prejudice. Applicants request reconsideration of claims 1, 3-11, 13, 15-23, 25-26, 28, 31-34 and 36 in view of the above amendments and the following remarks.

Examiner Interview Summary

A telephone interview was held with Examiner Tuan Vu on February 18, 2009. During the interview, Applicants and the Examiner discussed the present invention with the aid of figures and pseudo code originally described in the specification. Applicants and the Examiner have also discussed proposed claim amendments to claim 1 but did not come to an agreement to the proposed claim amendments to claim 1. Applicants have considered the Examiner's suggestions and have made appropriate changes to the claims amended herein.

Claim Rejection – 35 USC § 101

The Office has rejected claims 25-26 and 28-31 under 35 U.S.C 101 because the claimed invention is directed to non-statutory subject matter. In particular, the Office has adopted the "useful, tangible, and concrete result" inquiry in determining if claims 25-26 and 28-31 are directed towards non-statutory subject matter.

Applicants respectfully submit that the "useful, tangible, and concrete result" inquiry is inadequate to determine if claims 25-26 and 28-31 are directed towards non-statutory subject matter and the machine-or-transformation test outlined by the Supreme

Court is the proper test to apply (See *In re Bilski*, No. 2007-1130, 2008 U.S. App. LEXIS 22479, Fed. Cir. Oct. 30, 2008). According to *In re Bilski*,

"To be sure, a process tied to a particular machine, or transforming or reducing a particular article into a different state or thing, will generally produce a "concrete" and "tangible" result as those terms were used in our prior decisions. But while looking for "a useful, concrete and tangible result" may in many instances provide useful indications of whether a claim is drawn to a fundamental principle or a practical application of such a principle, that inquiry is insufficient to determine whether a claim is patent-eligible under § 101. And it was certainly never intended to supplant the Supreme Court's test. **Therefore, we also conclude that the "useful, concrete and tangible result" inquiry is inadequate and reaffirm that the machine-or-transformation test outlined by the Supreme Court is the proper test to apply.***"*

Applicants respectfully submit to the Office that claim 25 is directed to an apparatus for compiling a high-level programming language into an object code, i.e., the apparatus performs a <u>transformation</u> of the high-level programming language into an object code that can be executed on a machine. Applicants respectfully request the Office to withdraw the rejection of claim 25 as the apparatus of claim 25 fulfils the machine-or-transformation test outlined by the Supreme Court and therefore claim 25 constitutes a statutory category of patentable subject matter. Applicants also request the Office to withdraw the rejection of claims 26, 28, and 31 as they are dependent on claim 25 and therefore constitute a statutory category of patentable subject matter. The rejection of claims 29-30 is moot as they have been canceled without prejudice.

Claim Rejection – 35 USC § 102

The Office Action has rejected claims 1, 3, 5, 12-13, 15, 17, 24-26, 28-30, 32-34, and 36-38 under 35 U.S.C. § 102(e), as being anticipated by U.S. Patent No 7,007,271 issued to Kumar et al. (hereinafter referred to as "*Kumar*").

According to MPEP §2131,

"'A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.' (Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). 'The identical invention must be shown in as complete detail as is contained in the ... claim.' (Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989)). 'The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test, i.e., identity of terminology is not required.' (In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990))."

Claim 1, as amended herein, recites the following:

1.   A computer-implemented method of scheduling a plurality of instructions generated by a compiler based on an intermediate representation of source code, the method comprising:

for each of one or more of the plurality of instructions of one or more instruction types ready to be scheduled in a given cycle in a scheduling region, determining a new slack value based on a current maximum number of the instructions that can be scheduled in the given cycle for a target processor;

selecting up to the current maximum number of instructions from those instructions ready to be scheduled in the given cycle, based on a priority order associated with the new slack value; and

scheduling the selected instructions.

(Emphasis added)

Claim 1 is now directed to a computer-implemented method of scheduling a plurality of instructions generated by a compiler based on an intermediate representation of source code. In one embodiment of the invention, instruction scheduling is performed by taking into account, not only dependence height, but also the <u>available resources</u> of a computing system. The emphasized limitations of claim 1 recite for each of one or more

of the plurality of instructions of one or more instruction types ready to be scheduled in a given cycle in a scheduling region, determining a new slack value based on a current maximum number of the instructions that can be scheduled in the given cycle for a target processor and selecting up to the current maximum number of instructions from those instructions ready to be scheduled in the given cycle, based on a priority order associated with the new slack value.

As described in paragraph 40 of the specification, a target processor may include many types of resources that are available for execution of instructions and is able to process a given number of each instruction type in each cycle. As such, in a given cycle, the target processor can only process a current maximum number of instructions. This is illustrated in the example where a particular target processor is assumed to be capable of executing six arithmetic logic units (ALU) instructions and two store instructions per cycle.

In one embodiment of the invention, the slack value of each of the one or more instructions of one or more instruction types ready to be scheduled in a given cycle in a scheduling region is determined based on the current maximum number of the instructions that can be scheduled in the given cycle for a target processor. This is illustrated in the example described in the specification from paragraphs 41-59.

In one embodiment of the invention, after the slack value is determined, up to the current maximum of instructions from those instructions ready to be scheduled in the given cycle is selected based on a priority order associated with the new slack value [See paragraph 70].

By performing a method for each of one or more of the plurality of instructions of one or more instruction types ready to be scheduled in a given cycle in a scheduling region, determining a new slack value based on a current maximum number of the instructions that can be scheduled in the given cycle for a target processor and selecting up to the current maximum number of instructions from those instructions ready to be scheduled in the given cycle, based on a priority order associated with the new slack value, embodiments of the invention allows scheduling of instructions based on the available resources of a computing system to provide an optimal schedule of instructions in a region that is resource-bound.

Kumar merely describes a method of integrated instruction scheduling and register allocation. *Kumar* seeks to balance between instruction scheduling and register allocation by accepting some inefficiency in instruction scheduling and some spill-over register allocation of virtual registers. [See lines 51 to 58]

Kumar does not teach or suggest the limitations in amended claim 1 that recites for each of one or more of the plurality of instructions of one or more instruction types ready to be scheduled in a given cycle in a scheduling region, determining a new slack value based on a current maximum number of the instructions that can be scheduled in the given cycle for a target processor and selecting up to the current maximum number of instructions from those instructions ready to be scheduled in the given cycle, based on a priority order associated with the new slack value.

In contrast, amended claim 1 recites a method for each of one or more of the plurality of instructions of one or more instruction types ready to be scheduled in a given

cycle in a scheduling region, determining a new slack value based on a current maximum number of the instructions that can be scheduled in the given cycle for a target processor and selecting up to the current maximum number of instructions from those instructions ready to be scheduled in the given cycle, based on a priority order associated with the new slack value.

Therefore, since *Kumar* fails to teach at least one element in claim 1, Applicants respectfully request the Office to withdraw the rejection of claim 1. Independent claims 13, 25 and 32 similarly recite the same limitation in claim 1. All the arguments presented earlier for claim 1 apply fully to claims 13, 25 and 32. Therefore, dependent claims 3, 5, 15, 17, 26, 28, 33-34, and 36 are patentable as being dependent on the allowable base claims (MPEP2143.03). The rejection of claims 12, 24, 29-30, and 37-38 is moot as they have been canceled without prejudice.

Claim Rejections – 35 USC § 103

The Office Action has rejected claims 4, 9-11, 16, 21-23 and 31 under 35 U.S.C 103(a), as being unpatentable over *Kumar*.

In order to establish *prima facie* case of obviousness, the Supreme Court in KSR International Co. v. Teleflex Inc., 550 U.S. ___, ___, 82 USPQ2d 1385, 1395-97 (2007) identified a number of rationales to support a conclusion of obviousness which are consistent with the proper "functional approach" to the determination of obviousness as laid down in Graham. One of the rationales includes combining prior art elements according to known methods to yield predictable results. To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference;

(2) a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that in combination, each element merely performs the same function as it does separately;

(3) a finding that one of ordinary skill in the art would have recognized that the results of the combination were predictable; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

As discussed earlier, *Kumar* does not teach or suggest the limitations in amended claim 1 that recites for each of one or more of the plurality of instructions of one or more instruction types ready to be scheduled in a given cycle in a scheduling region, determining a new slack value based on a current maximum number of the instructions that can be scheduled in the given cycle for a target processor and selecting up to the current maximum number of instructions from those instructions ready to be scheduled in the given cycle, based on a priority order associated with the new slack value. Therefore, there is no *prima facie* case of obviousness as *Kumar* fails to teach at least one element of the limitation in claim 1, as stated in Graham factual inquiries. Applicant respectfully requests the withdrawal of the rejection of claim 1.

Independent claims 13 and 25 similarly recite the same limitation in claim 1. All the arguments presented earlier for claim 1 apply fully to claims 13 and 25. Therefore

dependent claims 4, 9-11, 16, 21-23 and 31 are patentable as being dependent on the allowable base claims. (MPEP2143.03)

Claim Rejections – 35 USC § 103

The Office Action has rejected claims 6-8, and 18-20 under 35 U.S.C 103(a), as being unpatentable over *Kumar*, in view of Cooper et al, 'An Experimental Evaluation of List Scheduling', Rice University, pp 1-15, September 1998. (hereinafter referred to as "*Cooper*").

As discussed earlier, *Kumar* does not teach or suggest the limitations in amended claim 1 that recites for each of one or more of the plurality of instructions of one or more instruction types ready to be scheduled in a given cycle in a scheduling region, determining a new slack value based on a current maximum number of the instructions that can be scheduled in the given cycle for a target processor and selecting up to the current maximum number of instructions from those instructions ready to be scheduled in the given cycle, based on a priority order associated with the new slack value.

Cooper describes an evaluation of list scheduling. *Cooper* also does not teach or suggest the limitations in amended claim 1 that recites for each of one or more of the plurality of instructions of one or more instruction types ready to be scheduled in a given cycle in a scheduling region, determining a new slack value based on a current maximum number of the instructions that can be scheduled in the given cycle for a target processor and selecting up to the current maximum number of instructions from those instructions ready to be scheduled in the given cycle, based on a priority order associated with the new slack value.

Therefore, there is no *prima facie* case of obviousness as both *Kumar* and *Cooper* fail to teach at least one element of the limitation in claim 1, as stated in Graham factual inquiries. Applicant respectfully requests the withdrawal of the rejection of claim 1.

Independent claims 13 and 25 similarly recite the same limitation in claim 1. All the arguments presented earlier for claim 1 apply fully to claims 13 and 25. Therefore dependent claims 6-8, and 18-20 are patentable as being dependent on the allowable base claims. (MPEP2143.03)

Conclusion

Applicants respectfully submit that the rejections have been overcome by the amendment and remark, and that the claims as amended are now in condition for allowance. Accordingly, Applicants respectfully request the rejections be withdrawn and the claims as amended be allowed.

Invitation for a Telephone Interview

The Examiner is requested to call the undersigned at (503) 439-8778 if there remains any issue with allowance of the case.

Request for an Extension of Time

The Applicant respectfully petitions for extension of time to respond to the outstanding Office Action pursuant to 37 C.F.R. § 1.136(a) should one be needed. Please charge the fee under 37 C.F.R. § 1.17 for such extension to our Deposit Account No. 02-2666.

Charge our Deposit Account

Please charge any shortage to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: <u>April 8, 2009</u>

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